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(56) Documents cited
GB 2154627 A GB 1086171 A GB 0945498 A
GB 0337904 A

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UK CL (Edition K) G4N NFFX NSBA NSBX
INT CL⁶ E05G, G08B
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(54) Security system

(57) A security system for protecting the enclosure of a security safe comprising a cavity wall 10 having inner and outer metal skins 11,12. A transmitter (20 Fig 2, not shown) launches microwave radiation into the cavity 13 between the metal skins and a receiver (30) monitors the radiation to detect penetration of the outer metal skin. The monitoring means either monitors the level of radiation or detects for doppler modulation.

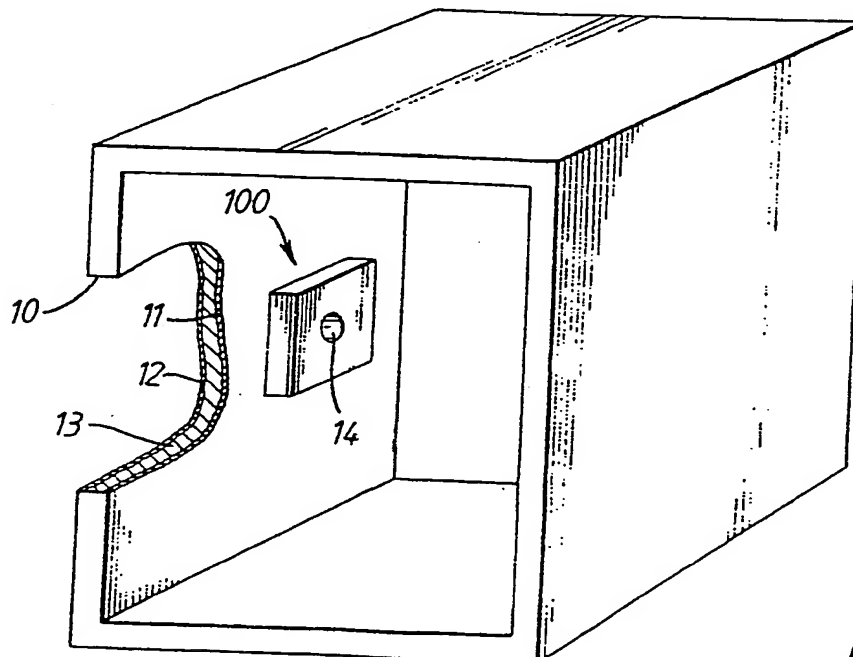


Fig. 1.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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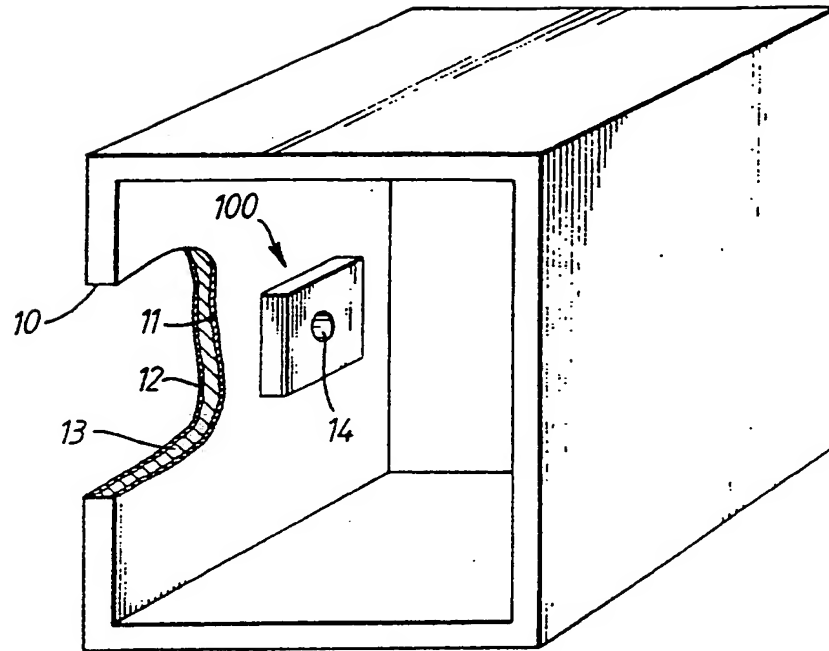


Fig. 1.

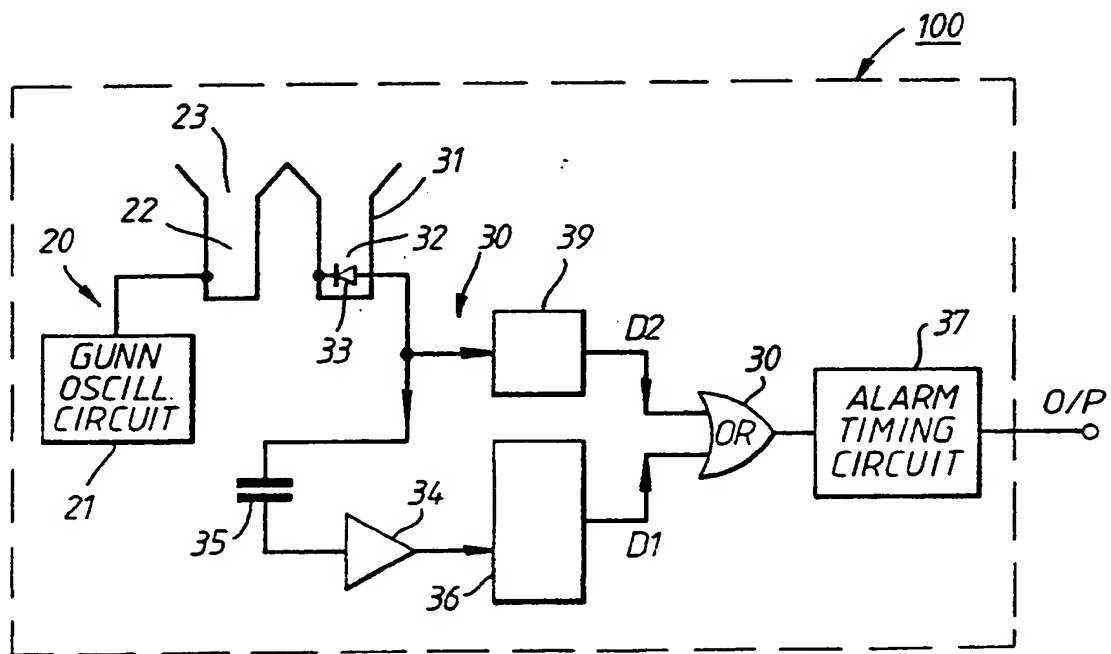


Fig. 2.

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SECURITY SYSTEM

This invention relates to security systems, particularly security systems for protecting enclosures bounded, at least in part, by wall structures having inner and outer metal skins. The invention also relates to methods for protecting such enclosures.

The invention relates particularly, though not exclusively, to such security systems and methods for protecting the enclosures of security safes.

Conventionally, a security safe comprises a cavity wall bounding the enclosure to be protected. The cavity wall has inner and outer metal skins, and it has been customary to fill the space between the metal skins with a dense, concrete-like material intended to hinder penetration of the wall. Security safes of this kind have been fitted with vibration sensitive devices which may be mounted inside or outside the enclosure and are able to detect vibrations produced if an attempt is made to break into the safe. Vibration sensitive devices have the disadvantage that they might also respond to vibrations produced by external sources e.g. passing traffic or machinery, and could therefore give rise to false alarms.

More recently, it has been the practice to fill the space between the metal skins with a mixture of elastomeric and abrasive materials. The elastomeric materials used in the mixture tend to absorb vibrations, and existing vibration sensitive devices do not have the required sensitivity.

The present invention provides a way of alleviating the afore-mentioned problems.

According to a first aspect of the invention there is provided a security system for protecting an enclosure bounded, at least in part, by a wall structure having inner and outer metal skins, comprising means for launching microwave radiation into the cavity between the inner and outer metal skins and means for monitoring the microwave radiation launched into the cavity whereby to detect penetration of the wall structure.

A security system, as defined, may be used to protect the enclosures of security safes, cabinets and vaults and it will be understood that said wall structure may include the walls and/or doors of such installations.

In a preferred embodiment of the invention, the monitoring means detects for a doppler modulation of the

microwave radiation. Accordingly, if the outer skin is penetrated, the monitoring means will become responsive to movement outside the wall structure.

Alternatively, or additionally, the monitoring means may be responsive to the change in level of microwave radiation in the cavity that would occur if the outer skin of the wall structure is penetrated and, to that end, the monitoring means may detect for a level of microwave radiation outside pre-set limits.

In a preferred embodiment, the security system is located within the enclosure being protected and microwave radiation is launched into the cavity through an opening in the inner metal skin.

According to a second aspect of the invention there is provided a method for protecting an enclosure bounded, at least in part, by a wall structure having inner and outer metal skins, the method comprising the steps of launching microwave radiation into the cavity between the inner and outer skins and monitoring said microwave radiation whereby to detect penetration of the wall structure.

It will be understood that security systems and methods in accordance with the invention have a range of

applications.

The invention can be used to protect the enclosures of security safes and cabinets. Generally, the door as well as the walls of a security safe or cabinet may comprise a said wall structure having inner and outer metal skins. The security system of the present invention could, therefore, be mounted on the door instead of, or in addition to, a wall.

The invention could alternatively be used to protect the enclosure of a security vault of which the vault door comprises a said wall structure having inner and outer metal skins. In this application of the invention, the security system would be mounted on the door, preferably on the inner metal skin thereof.

Security systems and methods in accordance with the invention are now described, by way of example only, with reference to the accompanying drawings of which:

Figure 1 shows a perspective, part-sectional view of a security safe fitted with a security system according to the invention, and

Figure 2 is a block schematic diagram illustrating the

security system.

Referring to Figure 1, the walls 10 of the security safe have inner and outer metal skins 11,12 defining a closed cavity 13, and in this embodiment the cavity 13 between the metal skins is filled with a mixture of elastomeric and abrasive materials.

The security system 100 is installed inside the safe, being mounted on the inner metal skin 11, and is arranged to launch microwave radiation into and receive such radiation from, the cavity 13 via an opening 14 in the inner metal skin.

Referring to Figure 2, the security system 100 comprises a transmitter 20 and a receiver 30.

In this embodiment of the invention, the receiver 30 can detect movement outside the wall 10 if the outer metal skin 12 has been penetrated and, to that end, the receiver is responsive to a doppler frequency shift in the received radiation which is caused when radiation from within the cavity 13 is reflected from a moving object outside.

Referring again to Figure 2, the transmitter 20 comprises

a Gunn oscillator circuit 21 connected to drive a Gunn device in transmitter cavity 22, launching microwaves using antenna 23, and the receiver 30 includes a receiving antenna 31 so positioned as to receive radiation from cavity 13 via the opening 14.

Microwave radiation received via the opening is mixed in a mixing cavity 32 of the receiving antenna with leakage radiation received directly from transmitter 20, and the resultant radiation is detected by a mixer diode 33 in the mixing cavity.

If the outer skin 12 has been penetrated, the microwave radiation received via opening 14 would be subject to a doppler frequency shift relative to the frequency of leakage radiation received directly from the transmitter. As a consequence of mixing the two slightly different frequencies, the voltage developed across the mixer diode 33, in response to the received radiation, would exhibit a doppler modulation.

The voltage across the diode 33 is applied to the input of a doppler amplifier 34 via a capacitor 35 and if the output of the amplifier exceeds a predetermined threshold level, signifying that a detected doppler modulation is due to penetration of the outer skin 12, a thresholding circuit 36 applies a first detection signal D_1 to an

alarm timing circuit 37 via one input of an OR gate 38 and thereby initiates an alarm signal on an alarm output line O/P.

In addition, a second thresholding circuit 39 monitors the voltage level across the mixer diode 33. If the voltage level across the diode changes by more than a pre-set amount (in either direction) with respect to a reference level, this provides an indication that the outer skin has been penetrated and the threshold circuit 39 applies a second detection signal D_2 to the alarm timing circuit 37, via the other input of the OR gate 38, so as to initiate the alarm signal on the output line O/P.

The door of the security safe may have the same general structure as the walls and so the security system could be mounted on the door in addition to, or instead of, on a wall.

It will be appreciated that the security system has a variety of different applications and could, for example, be used to protect the enclosure of a security vault of which the vault door is comprised of a cavity wall having inner and outer metal skins. In this case the security system would be mounted on the door, preferably on the inner metal skin.

CLAIMS

1. A security system for protecting an enclosure bounded, at least in part, by a wall structure having inner and outer metal skins, comprising means for launching microwave radiation into the cavity between the inner and outer metal skins and means for monitoring the microwave radiation launched into the cavity whereby to detect penetration of the wall structure.
2. A security system as claimed in claim 1, wherein the monitoring means detects for a doppler modulation of the microwave radiation.
3. A security system as claimed in claim 1 or claim 2, wherein the monitoring means monitors the level of microwave radiation in the space.
4. A security system as claimed in claim 3, wherein the monitoring means detects for a level of microwave radiation outside pre-set limits.
5. A security system as claimed in any one of claims 1 to 4, wherein the wall structure is a wall and/or door of a security safe, security cabinet or security vault.

6. A security safe, cabinet or vault incorporating a security system as claimed in any one of claims 1 to 5.

7. A method for protecting an enclosure bounded, at least in part, by a wall structure having inner and outer metal skins, the method comprising the steps of launching microwave radiation into the cavity between the inner and outer skins and monitoring said microwave radiation whereby to detect penetration of the wall structure.

8. A method as claimed in claim 7, wherein the monitoring step includes detecting a doppler modulation of the microwave radiation.

9. A method as claimed in claim 7 or claim 8, wherein the monitoring step includes monitoring the level of microwave radiation in the space.

10. A security system substantially as herein described with reference to the accompanying drawings.

11. A security safe, cabinet or vault substantially as herein described with reference to the accompanying drawings.

12. A method for protecting an enclosure substantially

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as herein described with reference to the accompanying drawings.

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Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

Application number 9024058.1

Relevant Technical fields

(i) UK CI (Edition K) G4N (NSBA, NSBX, NFFX)

(ii) Int CI (Edition 5) G08B, E05G

Databases (see over)

(i) UK Patent Office

(ii) WPI

Search Examiner

S J L Rees

Date of Search

5 February 1991

Documents considered relevant following a search in respect of claims

all claims

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2154627 A MAN BARRIER CORP - page 1 lines 9-21 and page 3 lines 101-107	1, 3, 4
Y	GB 2154627 A	5, 6, 7, 9
X	GB 1086171 WATSON - whole document	1, 3, 4
Y	GB 1086171	5, 6, 7, 9
Y	GB 945498 COMPAGNIA - whole document especially page 1 lines 20-24, page 4 lines 51-63 and 111-120	5, 6, 7, 9
X	GB 337904 PHILIPS - page 1 lines 9-30	1, 3, 4
Y	GB 337094	5, 6, 7, 9

SF2(p)

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Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).